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10/030,206	12/31/2001	Peter Kenington	46309/268337 (23890)	9002

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EXAMINER	
TORRES, JUAN A	
ART UNIT	**PAPER NUMBER**
2631	

DATE MAILED: 09/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Advisory Action Before the Filing of an Appeal Brief	Application No.	Applicant(s)	
	10/030,206	KENINGTON, PETER	
	Examiner	**Art Unit**	
	Juan A. Torres	2631	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 09 September 2005 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: *see attachment*. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: *51,54,57,62,65,68 and 73-90*.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: see attachment.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08 or PTO-1449) Paper No(s). _____
13. ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed on 09/09/2005 have been fully considered but they are not persuasive.

Claims 51 and 62:

The Applicant contends:

"Claims 51 and 62 have been amended to recite the features recited in previously recited (now canceled) claims 54 and 65, respectively.

As such, currently amended claim 51 is directed to a lineariser for reducing distortion of an output signal of signal handling equipment, by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal. The store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

As explicitly described in the specification of the present application, a raw signal can be divided into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies. For example, in the embodiment shown in Fig. 2, different copies of a raw, I channel input signal are applied to different band-pass filters, each corresponding to a different band of frequencies. As such, the output of each different band-pass filter is a "raw component" signal corresponding to a different band of frequencies. The

amplitudes of these different raw component signals are used as indices into a set of LUT's, where each different LIJT corresponds to a different band of frequencies, as represented in Fig. 3.

As another example, in the embodiment shown in Fig. 4, the raw, I channel input signal is applied to a fast Fourier transform that converts the time-domain input signal into the frequency domain, where the signal is represented by a plurality of components, each corresponding to a different frequency, where the amplitude of each component is used as the index into a different LUT corresponding to the frequency of that component.

In rejecting previously pending claim 54, the Examiner cited Figs. 8 and 12 and column 14, lines 16-34, of Leyendecker. On page 4, the Examiner stated that "The frequency content of the signal is clearly described in the cited section when (Leyendecker) mentions a predistortion filter, that will be frequency dependent." The Applicant submits that the issue is not whether the signal has "frequency content"; the issue is whether <u>each</u> of a plurality of <u>LUTs</u> corresponds to a <u>different</u> frequency or band of frequencies.

The Examiner stated further on pages 4-5 that "the frequency dependence is expressed as he very well known term 'bin'; also in tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins," citing column 14, line 10, to column 18, line 57. The teachings in column 14, line 10, to column 18, line 57, relate to a process for updating the values stored in Leyendecker's LUT.

In particular, according to that LUT update process, after interpolating data samples, "trainer 431 then quantizes the samples into 'bins' that are equal in number to the number of table addresses in the predistorter LUT." See column 14, lines 16-18. As known in the art, a bin refers to a specified range of values. In Leyendecker, each bin corresponds to a specific range of amplitude values for the data samples, where a bin value represents the number of data samples that had amplitude values that fell within the range of amplitude values corresponding to that bin. These bin values are then used to update the LUT data.

None of this has anything to do with multiple LUTs corresponding to different frequencies or different bands of frequencies. Leyendecker does not teach or even suggest a plurality of LUTs, where each table corresponds to a component of the raw signal having a different frequency or band of frequencies. Significantly, the bins taught in Leyendecker correspond to different ranges of signal amplitudes, not to different signal frequencies. Moreover, Leyendecker does not teach that the different bins have to have different bin values. For example, there is nothing in the teachings in Leyendecker that would prevent two bins corresponding to different amplitude ranges from having the same value.

For all these reasons, the Applicant submits that currently amended claim 51 is allowable over Leyendecker. For similar reasons, the Applicant submits that currently amended claim 62 is allowable over Leyendecker. Since claims 57 and 68 depend from claims 51 and 62, it is further submitted that those claims are also allowable over Leyendecker.".

The Examiner disagrees and asserts, that, as indicated in the previous Office action, Leyendecker discloses a lineariser for reducing distortion of an output signal of signal handling equipment by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal (figure 6 column 10 lines 16-39). Leyendecker states, "The trainer 431 then quantizes the samples into "bins" that are equal in number to the number of table addresses in the predistorter LUT. In the preferred embodiment, the validator 1203 checks that there are enough data samples in a bin and that their distribution is statistically significant (i.e., not too much variation). If the values associated with a bin are qualified by the validator 1203, then the average of these values is calculated to derive a new complex parameter value for each bin. For example, in one embodiment, a least squares method is used to determine an average value of the complex parameter for each bin. The calculated values for each bin can then be used to update the predistorter LUT. In a further refinement, each calculated parameter can be averaged or filtered with the corresponding previously trained parameters (or, alternatively, a weighted average of previously trained parameters) to generate the updated parameter. This averaging is used to smooth out changes in the parameter and to get a better parameter estimate. This value can then be used to update the predistorter LUT"....." In addition, any parameters calculated for bins having a number of samples below a predetermined threshold are discarded, resulting in empty bins. The interpolator/extrapolator 1205 then determines the parameters of the empty bins (if any) by interpolation or extrapolation from the other surrounding bins"..." The solver 1201 calculates complex parameters by

forming the F and R matrices **<u>for each table bin</u>** as described above in conjunction with FIG. 13 to implement a pseudo-linear least squares technique" (column 16 lines 25-29)...." In a next step 1325, the interpolator/extrapolator 1205 fills in the emptied bins by interpolation or extrapolation from other surrounding bins which were trained. A simple linear interpolation or extrapolation between the nearest bins that passed validation can be performed, but in a preferred embodiment, the interpolation and extrapolation is performed using standard curve fitting techniques that take into account the whole range of values that passed the validation process". The frequency content of the signal is clearly described in the cited section when he mention a predistortion filter, that will be frequency dependent, <u>using a single LUT table for each bin</u> (see figure 8 blocks 806_1-806_M). As Leyendecker pointed out in that paragraph more detail of the frequency dependence is in fig. 12-13A where the frequency dependence is expressed as the very well known term "bin"; also in tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins (column 14 line 10 to column 18 line 57). Leyendecker discloses that the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table (figure 8 and figure 12 column 14 lines 16-34). The frequency content of the signal is clearly described in the cited section when he mentions a predistortion filter, that will be frequency dependent. As Leyendecker pointed out more detail of the frequency dependence is in fig. 12-13A where the frequency dependence is expressed as he very

well known term “bin”; also in tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins (column 14 line 10 to column 18 line 57). For these reasons and the reason stated in the previous Office Action, the rejection of claims 51 and 62 are maintained.

Claims 57 and 68:

The Applicant contends:

“According to claims 57 and 68, the raw signal is divided into a number of components having different frequencies or bands of frequencies. In rejecting claim 57, the Examiner cited Fig. 12, block 1201, and column 14, lines 16-34, of Leyendecker. As described ill column 14, lines 16-34, solver 1201 quantizes the samples into bins based on the different amplitudes of the samples. Solver 1201 does not divide a raw signal into components having different frequencies or bands of frequencies. The Applicant submits that this provides additional reasons for the allowability of claims 57 and 68 over Leyendecker.“.

The Examiner disagrees and asserts, that, as indicated in the previous Office action, The interpolation/extrapolation is in frequencies “bins”. When a frequency that is not in the table is needed, the an interpolation/extrapolation is performed. The sample are frequency samples, “bins”. For these reasons and the reason stated in the previous Office Action, the rejection of claims 57 and 68 are maintained.

Claims 73 and 82:

The Applicant contends:

"Claims 73 and 82 have been amended to recite the features recited in previously recited (now canceled) claims 77 and 86, respectively.

As such, currently amended claim 73 is directed to a method for reducing distortion in an output signal generated by siral handling equipment. In particular, a raw signal is divided into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies. A modified component is generated for each raw component based on the amplitude of the raw component by retrieving. for each raw component. a value for the corresponding modified component from a look-up table ILUTI based on the amplitude of the raw component. wherein each different frequency or band of frequencies has its own LUT. The plurality of modified components are combined to generate a modified signal. The Applicant submits that Wright does not teach or even suggest such a combination of features.

The Examiner cited Figs. 15-17 and column 28, line 48, to column 29, line 17 in rejecting previously pending claims 77 and 86. Figs. 15-17 show power amplifier models of progressively increasing orders of complexity. Each model has an Fm filter 76 and a LUT 78 that stores different sets of coefficients for the FIR filter. In particular, Fig. 15 shows a one-dimensional LUT whose FIR coefficients are accessed using an address derived from the magnitude of the input signal Vm(t). Fig. 16 shows a two-dimensional LUT whose FIR coefficients are accessed using a first address derived from the magnitude of the input signal Vm(t) and a second address derived by differentiating the input signal Vm(t). Lastly, Fig. 1 7 shows a three-dimensional LUT whose FIR

coefficients are accessed using a first address derived from the magnitude of the input signal Vm(t), a second address derived by differentiating the input signal Vm(t), and a third address derived by integrating the input signal Vm(t). According to Wright, the model of Fig. 17 "permits the amplifier's nonlinearity to be characterized as a function of frequency, input signal level, rate of change of envelope and integrated past power profile." See column 29, line 9-13.

Significantly, Wright does not teach dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies and where a modified component is generated for each raw component based on the amplitude of the raw component by retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT.

In rejecting previously pending claims 73 and 82, the Examiner cited Wright's Figs. 3 and 8 as showing examples of dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies.

Wright's Fig. 3 shows one embodiment of digital compensation signal processor (DCSP) 52 having a predistortion Fm filter 52A that alters an input signal Vm(t) based on filter coefficients retrieved from two-dimensional LUT 5214. Wright's Fig. 8 shows an expansion of DCSP 52 having four predistortion FIR filters 52A, each of which filters a

different-order multiple of input signal Vm(t) based on filter coefficients retrieved from three-dimensional LUT 5211.

If Wright's Figs. 3 and 8 teach "dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies," then Wright's "raw components" must be the outputs of the four FIR filters in Fig. 8.

But if those are examples of the raw components of currently amended claims 73 and 82, then Wright fails to teach "generating a modified component for each raw component based on the amplitude of the raw component by retrieving, for each raw component, a value for the corresponding modified component from a look-up table ILUTI based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT." The only LUT taught by Wright is LUT 5211 of Fig. 8, which is analogous to LUTs 78 of Figs. 15-17. Significantly, Wright's "raw components" (i.e., the outputs from the FIR filters) are not used to retrieve values from any LUTs. As such, Wright does not teach or even suggest the features of currently amended claims 73 and 82.

In view of the foregoing, the Applicant submits that currently amended claims 73 and 82 are allowable over Wright. Since new claims 74-76, 78-81, 83-85, and 87-90 depend variously from claims 73 and 82, the Applicant submits that those claims are also allowable over Wright.

The Applicant submits therefore that the rejections of claims under Section 102(e) have been overcome.".

The Examiner disagrees and asserts, that, as indicated in the previous Office action, Wright discloses a method and apparatus for reducing distortion in an output signal generated by signal handling equipment, the method comprising: dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies (column 2 lines 25-37 and lines 60-66; figure 3 and 8 block 52A, column 16 line 52 to column 17 line 45; column 15 line 54 to column 16 line 26; figures 18 and 19 column 31 lines 21-26); generating a modified component for each raw component based on the amplitude of the raw component (figures 1 and 8 block 52A column 15 line 54to column 16 line 26); and combining the plurality of modified components to generate a modified signal (figures 1 and 8 block adder vd(t) column 15 line 54 to column 16 line 26); retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component (figure 15-17 column 28 line 48 to column 29 line 17); and each different frequency or band of frequencies has its own LUT (figure 15-17 column 28 line 48 to column 29 line 17). This point is very clear is some figures of Wright that are "identical" the figures presented in this Applications. Examiner points out that figures 19 and 24B are the same that figure 3 of Applicants. Referring to Figures 19 and 20 show how each frequency sample point (sampling in the frequency domain) has its own table in function of the amplitude. Wright states "The set of resulting vectors are then stacked to form a 2-dimensional matrix with frequency and amplitude axes. Each element of the matrix stores the amplitude and gain response of the amplifier at a particular frequency and input

amplitude level. FIG. 19 illustrates the gain response contained within the matrix. The individual FIR filters that describe the wideband frequency domain response of the amplifier 64 are computed by taking a sub matrix or vector from the matrix in a cross dimension of constant amplitude and varying frequency " (column 31 lines 21-30).So for each frequency it is one table, each of the column in FIG. 20. The same can be seeing in figures 24B and 25A –25B. For each frequency sample it is one table in function of the amplitude of the raw signal. Wright states "As illustrated in FIG. 24B, the overall objective of this process is to adjust the DCSP coefficients so that the overall system response is a pure linear function of the input signal's frequency and instantaneous amplitude" (column 35 lines 27-30). For these reasons and the reason stated in the previous Office Action, the rejection of claims 73 and 82 are maintained.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Juan Alberto Torres, Ph. D.
09-15-2005

KEVIN BURD
PRIMARY EXAMINER